Growing WILD

Spring 1999

Utah's Project WILD Newsletter

Utah's Amazing Amphibians

As spring breaks free of winter's grasp, sounds of life fill the air. In the early dawn or dusk, impressive, resonating choruses of croaks, chirps, squeaks and peeps signal the gathering of hundreds or even thousands of frogs as they congregate at their breeding ponds. Frogs and their relatives, toads, salamanders, newts and caecilians (an unusual group of legless, worm-like burrowers), form the class of animals called Amphibia.

Amphibians are the oldest terrestrial vertebrate group on earth, with some of the earliest fossils dating from the late Devonian about 360 million years ago. The most likely ancestors of these early amphibians were lobe-finned fishes in the order Crossopterygii which had lungs, internal nostril openings and fins supported by cartilaginous rays. Early amphibians were much larger than those of today (up to 12 feet long) and were covered in bony plates for protection. By the late Jurassic (around 190 m.y.a.), "modern" amphibians with skeletal shapes and body plans similar to those of today had become a dominant and flourishing group. Extinctions took their toll over time, however, and today they are the smallest class of living vertebrates with about 4,000 known species.

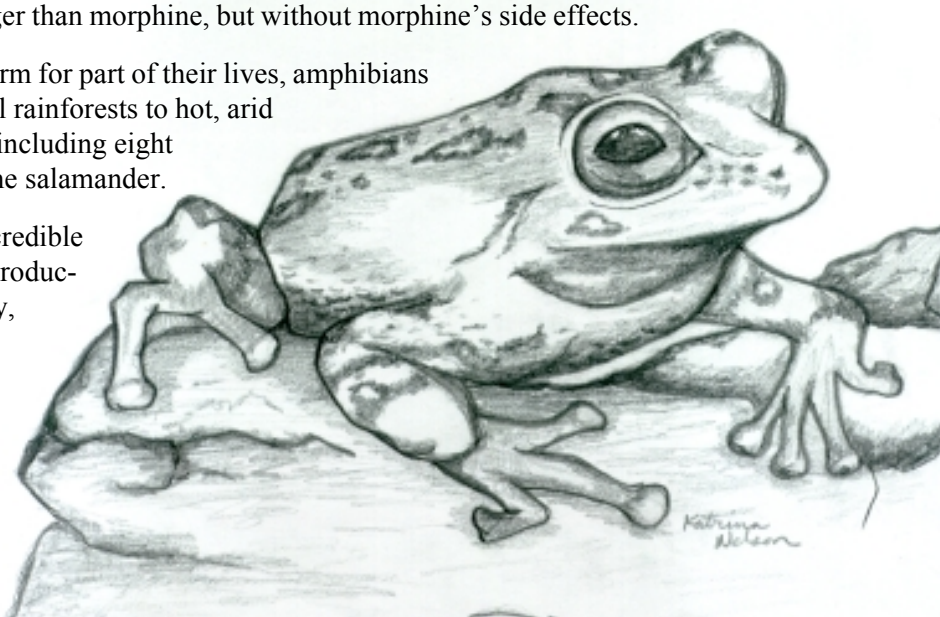
The Latin term *amphibios* from which amphibian is derived literally means "a being with two lives." It refers to the fact that most amphibians spend part of their lives in water and part on land. Although, amphibians as a whole are extremely diverse, most lay strands or clusters of jelly-coated eggs in water that hatch into free-swimming, gilled larvae that later develop into land-dwelling adults with lungs. This process, metamorphosis, is a distinct characteristic of amphibians, the only vertebrate group in which it occurs.

Amphibians are found worldwide, except in polar regions or at high altitudes where the land is permanently covered with snow, or within the sea. They are cold-blooded (ectothermic), relying on the temperature of the air, water and soil surrounding them to regulate their body temperatures. They possess myriad adaptations to survive in harsh conditions. For example, in colder regions, some amphibians will burrow underground and hibernate to keep from freezing during the winter.

Amphibians are also characterized by moist, glandular skins through which they are able to absorb water and oxygen. They possess two main types of glands, mucous glands to keep their bodies moist, and poison glands which secrete a milky, sticky substance that is distasteful to predators. Some secretions are not only distasteful but deadly, a fact discovered by various Central and South American native cultures which, for years, have utilized the skin secretions of poison arrow frogs to coat the tips of their blowgun darts. More recently, scientists have isolated substances from frog poison glands to create a new painkiller stronger than morphine, but without morphine's side effects.

Although tied to water or moisture in some form for part of their lives, amphibians inhabit a great variety of habitats from wet, tropical rainforests to hot, arid deserts. Utah is home to a fair number of species, including eight toads, nine frogs (two of which are exotics) and one salamander.

Amphibians, intriguing animals due to their incredible diversity of form, color and size, and the varied reproductive, predation and defensive strategies they employ, have been a fascination to many. Celebrated in legend and lore, lately they have received even greater attention as they have become recognized as valuable indicators of environmental health.

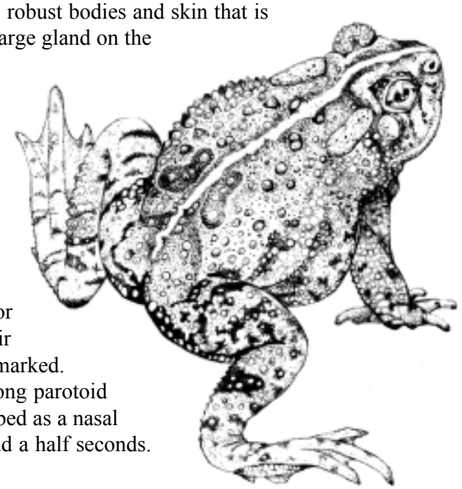


Turn the page and read on to learn more about Utah's Amazing Amphibians!

Awesome Amphibians!

Woodhouse's Toad — *Bufo woodhousei*

The Woodhouse's toad, named after the 19th century explorer and naturalist Samuel Woodhouse, is a member of the true toad family, Bufonidae. True toads are characterized by stocky, robust bodies and skin that is conspicuously covered with well developed glands. The parotoid gland, a large gland on the neck, immediately behind the eye, is a feature exclusive to true toads.



Woodhouse's Toad

Woodhouse's toads range throughout most of the central and eastern United States, excluding higher elevations of the Rocky Mountains. In Utah they can be found throughout most of the state except within the West Desert, which basically forms the western boundary of their range. Their habitat includes sandy riverbanks, marshes, irrigation ditches, backyard ponds and temporary rain pools.

Woodhouse's toads are large toads reaching lengths of up to five inches. Their rough, bumpy skin varies from yellowish-green to light brown in color and they have a distinct light-colored stripe running down the middle of their back. Their bellies are whitish or yellowish, and are usually completely unmarked. Woodhouse's toads also have pronounced, squared-off cranial crests and long parotoid glands about two times the length of their upper eyelid. Their call is described as a nasal w-a-a-a-a-a-h, similar to the bleat of a sheep, that lasts about one to two and a half seconds. Males call while siting in quiet pools.

Breeding takes place between March and August and occurs in shallow waters in a variety of places including cattle tanks, ditches, flood plains of rivers and sloughs. Eggs are deposited in tangled stringy masses and attached to vegetation or debris. Each female can lay up to 25,000 eggs which hatch after a few days.

Great Basin Spadefoot Toad — *Spea intermontanus*

The Great Basin spadefoot toad ranges throughout the Great Basin of western North America. Within its range, it inhabits pinyon-juniper woodlands, sagebrush flats and semi-desert shrublands in or near dry rocky slopes or canyons. The Great Basin spadefoot is distinguished from other Utah spadefoots by its glandular "boss," a raised area between its eyes, and a pair of light stripes on its sides that offset an hourglass marking on its back.

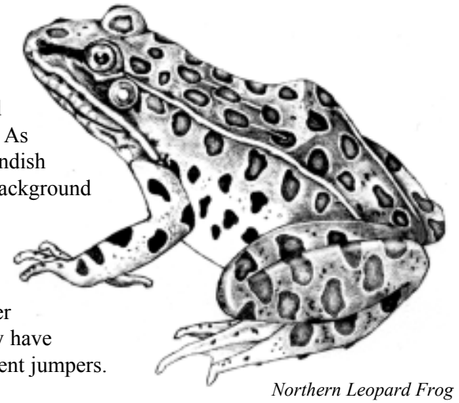
Spadefoots, family Pleobatidae, are not considered true toads. They differ in several ways, including having relatively smooth skin, no parotoid glands, eyes with cat-like vertical pupils, teeth in their upper jaw and, as their name indicates, a single sharp, black metatarsal tubercle on the inner side of each hind foot that, like a spade, is used for digging.

During the winter, spadefoots dig deep into the soil below frost line to escape desiccation. When burrowing, they literally back into the ground by pushing dirt with their spades, while rotating their body. Herpetologists have found some spadefoots buried up to 15 feet below ground. Here they remain dormant for much of the year. It's not until raindrops from a heavy summer thunderstorm pelt the ground that spadefoots arise. Interestingly, its not the rain itself that awakens them from their slumber, but the vibrations associated with the raindrops as they hit the ground.

Great Basin Spadefoot Toad

Upon emerging, the spadefoots head directly to the nearest ponds that are forming. The rapid, low-pitched, throaty wa-wa-wa call of the males serves to attract mates. With urgency, they feed, breed and lay eggs in a short period of time to ensure they can again burrow into the soil when conditions dry out once more. In approximately 10 days the eggs hatch and the tadpoles metamorphose so the young too can burrow underground for the rest of the year.

Northern Leopard Frog — *Rana pipiens*



Northern Leopard Frog

The northern leopard frog is the frog that most of us became well acquainted with in high school biology. It is a member of the true frog family, Ranidae. As its name suggests, leopard frogs are covered with well-developed oval to roundish dark spots. The spots, bordered with a pale color in this species, rest on a background of green or light brown.

In addition to the characteristic spots, northern leopard frogs also bear distinct light-colored, parallel dorso-lateral folds, glandular ridges that extend from behind the eyes to the lower back, and have a white stripe on their upper jaw. They are medium-sized frogs growing up to five inches in length. They have long hind legs and webbed feet, making them powerful swimmers and excellent jumpers. To avoid capture, they can leap five to six feet!

The range of the northern leopard frog, the widest of any North American frog, extends across most of the south-western states, north and east over much of Canada, to the Atlantic coast. Within their range, leopard frogs occupy springs, slow-flowing streams, marshes, bogs, ponds, canals and reservoirs; almost anywhere with permanent water and rooted aquatic vegetation from low valleys to mountain ridges. They are sometimes called "meadow" or "grass" frogs because often they forage well away from water. They eat a variety of prey, including large insects, worms and spiders. It is primarily movement of prey that attracts the frog, however, research has shown that smell may be used as well. These frogs in turn, are eaten by snakes, turtles, herons and raccoons, to name but a few predators.

Northern leopard frogs winter in the mud at the bottom of water bodies that do not freeze solid. In spring, they emerge and begin calling. Their call resembles a motorboat or snorelike vibration interspersed with grunting and chucking sounds that lasts between one and five seconds. Both sexes look similar, but males are slightly smaller. Also, during the breeding season, the thumbs on the front feet of the male swell. This most likely helps during amplexus, when the male embraces the female from behind as she lays her eggs.

Boreal Chorus Frog — *Pseudacris maculata*

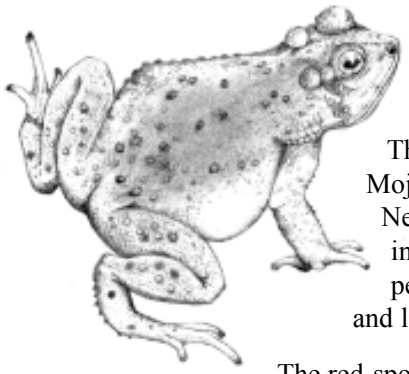
Although a member of the tree frog family, Hylidae, the boreal chorus frog is not a good climber and is mainly a ground-dwelling frog. Chorus frogs, in general, are small, slim-waisted, long-legged, delicate frogs with smooth skin.

The one- to two-inch-long boreal chorus frog is a greenish gray to brown-colored frog with dark stripes or rows of spots that form three lines down its back. In addition to the three stripes on its back, it has a dark stripe on each side that runs through the eye all the way from the snout to the groin. It also has a white stripe along its upper lip. Individuals in the same locality can vary greatly in color pattern though. The majority of literature that discusses this frog lists it as a subspecies of the western or striped chorus frog, *Pseudacris triseriata,* but as of 1990, the Society for the Study of Amphibians and Reptiles has recognized it as its own distinct species. Its stockier proportions, shorter legs and rounded toe tips without pads help to distinguish this species from other chorus frogs.

In Utah the boreal chorus frog ranges across most of the state except within the Great Basin and the very southeast-ern portion of the state. From Utah northward its range extends far up into and across much of Canada. It tends to be a frog of grassy areas, damp marshes, woodlands, river swamps and agricultural and suburban habitats where pollution and pesticides are not a problem. They occur within almost all life zones and have been found at elevations of 12,000 feet in the Uinta Mountains in Utah.

Boreal Chorus Frog

Boreal chorus frogs are secretive and seldom seen, but they can often be heard, both night and day, singing in great numbers during the breeding season. Their call, described as a rasping, ascending trill that lasts about one to two seconds, can be imitated by running a fingernail over the teeth of a pocket comb. Males call while sitting upright on floating vegetation. In most parts of its range, this frog is one of the earliest breeders, emerging from its winter retreat as early as late March or early April. In warmer areas, it can breed all winter, even in pools bordered with ice!



Red-Spotted Toad

Red-Spotted Toad — *Bufo punctatus*

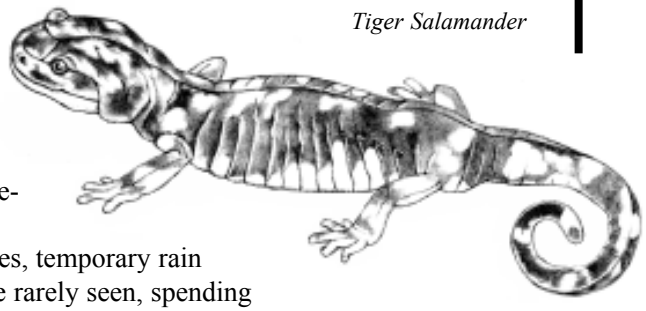
The red-spotted toad is a toad of the deserts. It ranges south from the Colorado Plateau and Mojave Desert regions of southern Utah through desert areas of eastern California, Arizona, New Mexico and western Texas, down into Baja California and central Mexico. They inhabit rocky canyons and arroyos below 6,000 feet in elevation and are usually found near permanent sources of water such as desert streams or springs. They can climb with ease and live among rocks, finding shelter in crevices, or sometimes in the burrows of rodents.

The red-spotted toad, as its name implies, sports reddish-colored bumps on its back that are sometimes set in small, dark blotches. Its overall color is olive green to grayish brown. It is a small, flat-bodied toad, growing only to about two to three inches in length. Its cranial crests are very weak or totally absent, and it has small, round parotoid glands slightly smaller than the size of its upper eyelid. Its call is a high-pitched, clear musical trill that lasts between six and ten seconds.

Survival in the desert can be precarious, and like all desert amphibians, the red-spotted toad must be concerned with staying moist. To address this problem, these toads limit their activity to the hours of twilight and night when the sun's heat has subsided. They also have an especially well developed "seat patch," an area on their undersides that allows for the absorption of moisture from the ground. In addition, to replace water lost from their bodies during dry periods, they store water in their bladder, a fact you may discover if you handle one too roughly!

Tiger Salamander — *Ambystoma tigrinum*

Tiger Salamander



The tiger salamander is the most widely distributed salamander in North America. It is Utah's only salamander, occurring in all regions except parts of the West Desert. Within their range, tiger salamanders occupy a wide variety of habitats from arid sagebrush plains to mountain meadows and forests below 11,000 feet. They are generally found in quiet waters of ponds, reservoirs, lakes, temporary rain pools and streams. Despite their widespread distribution, they are rarely seen, spending most of their time hidden in damp places such as rodent burrows, rotting logs and window wells, and emerging mainly at night to prey on insects, earthworms and other small invertebrates.

Tiger salamanders, one of the largest, land-dwelling salamanders in the world, can grow up to 13 inches in length, however, most are between six and nine inches long. Their tail, flattened sideways, makes up about half their length, and males have longer tails than females. They have moist, smooth skin that is dark-olive to almost black with yellow or pale, green banding, marbling or mottling that forms a network of "tiger-like" markings. There is much variation in their coloration, however. They have robust bodies with a broad, rounded snout, and small beady eyes. Their legs are short and their feet are not webbed. They have four toes on their front feet and five on their hind feet.

In spring tiger salamanders migrate to ponds and lakes to breed. In an elaborate courtship ritual called swarming, males pursue and nudge the females. Eventually the male deposits a small, triangular packet called a spermatophore onto the bottom of the pond. The female picks up this packet to fertilize the eggs within her body. Eggs are deposited onto submerged vegetation or debris and hatch in about five to ten weeks.

The fish-like larval tiger salamanders, sometimes mistakenly called water-dogs, are a uniform, pale-green color with a wide golden stripe that runs down their back. They have conspicuous external gills and feed on a variety of aquatic invertebrates. By mid-summer, in most cases, the larvae metamorphose into adult tiger salamanders. In some mountainous regions of the West, though, the larvae overwinter in their ponds and delay metamorphosis until the following spring. Some scientists speculate this delayed metamorphosis may be due to short growing seasons and low temperatures. In some populations the larvae never undergo metamorphosis, but still become sexually mature, a phenomenon called neoteny. Neotenic individuals, known also as *axolotls*, a Mexican Indian name, are usually found only in permanent and fish-free bodies of water.

Resources

Quick, Jump On These!!

Free Resources: Call Project WILD at: (801) 538-4719

Toads and Frogs of Minnesota and Their Habitats Poster - A beautiful full-color poster featuring 11 species of frogs and 3 species of toads in their adult habitats with information on the back about distribution, frog calls and descriptions.

Utah's Amphibians and Reptiles - A small, nicely illustrated booklet giving general information about the state's amphibians and reptiles.

Utah Native Sport Fish Poster - A new, beautifully illustrated poster featuring the six native sport fish found in Utah, including our state fish, the Bonneville Cutthroat Trout.

Leap Frog Game - An enlarged copy of a game board used to play a game which helps kids learn more about the hazards frogs face as they grow from eggs to tadpoles to adult frogs during the course of a year.

For Check-out:

Amphibian Videos - Two videos on amphibians, one from the "Eyewitness" series and another from the "Bill Nye the Science Guy" series, are informative and entertaining teaching supplements.

Cat Crate - A newly completed materials kit containing hides, skulls and educational resource material to share information about Utah's wonderful wild cats, the mountain lion, the bobcat and the rare lynx.

Amphibian Internet Sites:

Visit the fun and interesting site, "FROGLAND," at **http://www1.teleport.com/~dstroy/froglnd.shtml** to learn a world of information about frogs.

A great online interactive educational activity at **http://www.aquarium.org/education/spotlight/disappearingfrogs/index.htm** features a mystery-like presentation of the puzzling decline of amphibians worldwide.

Http://www.npwrc.usgs.gov/resource/1998/specieid/specieid.htm#bufonidae is an excellent "Online Guide for Amphibians in the United States and Canada" with good species information and pictures.

The North American Amphibian Monitoring Program at **http://www.im.nbs.gov/amphibs.html** offers teacher resources and ways for students to become involved in monitoring amphibian populations locally.

"A Thousand Friends of Frogs" at **http://cgee.hamline.edu/frogs/** is an interactive and informative site with engaging activities for students and educators to discover all about frogs.

The "Froggy Page" at **http://frog.simplenet.com/froggy/** is home to all kinds of froggy stuff, from the silly to the scientific.

Http://www.frogweb.gov/education.html is good site pointing to a series of other educational frog links.

Objective: To familiarize students with the changes that take place in amphibians as they undergo metamorphosis from eggs to adults.

Method: Students create a flip-book in which they illustrate the various developmental stages (eggs, tadpoles and adults) through which frogs progress during metamorphosis.

Background: See *Nature's Call* included in this issue of *Growing WILD* (middle section of newsletter).

Materials: Drawing implements for each student, scissors, a heavy-duty stapler, cardstock sheets with photocopy of flip-book page (about 10 pages per student).

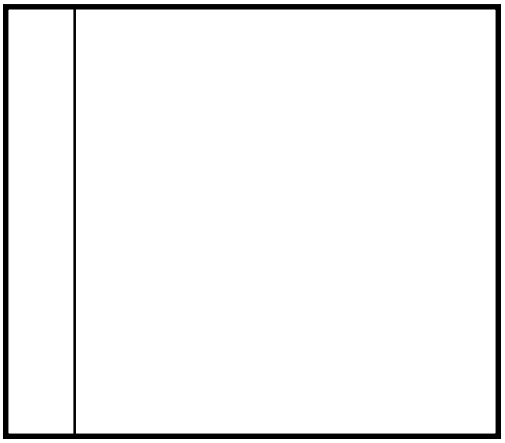
Procedure:

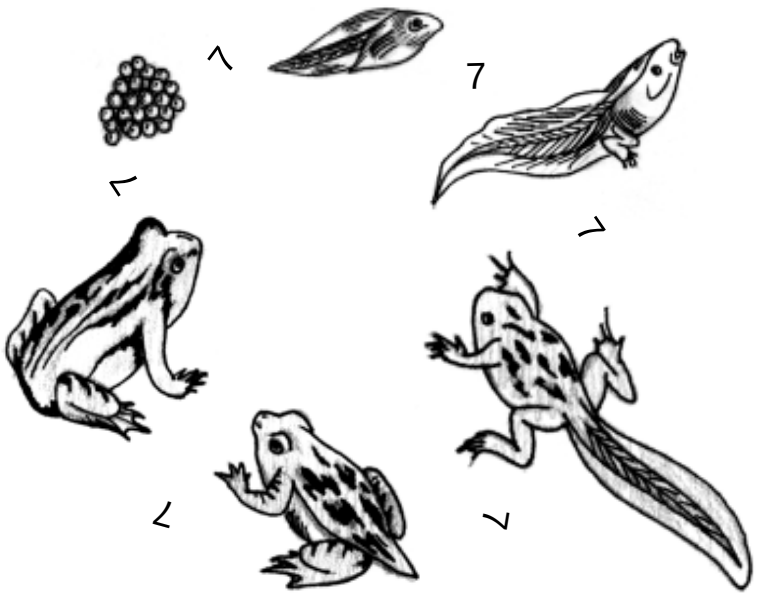
1) Discuss metamorphosis with students describing the different stages through which a frog goes as it changes from an egg to an adult. Show them some pictures from a book if possible. A good reference is: Pond Life by Barbara Taylor, Look Closer Series, Dorling Kindersley, Inc., 1992. (pages 20-21). On the internet, see the Frog Life cycle at http://aoife.indigo.ie/~ipcc/lifecycle.html.

2) Distribute photocopied cardstock flip-book pages to students. Have them illustrate the different stages of frog metamorphosis in a **progression** from egg to adult frog within the squares that will form the flip-book. Let them be creative, but have them show details for the specific changes in each stage. Tell them each drawing should be similar to the one before with only slight changes. Tell them not to draw to the left of the line in each square. They don't have to use all 10 squares but probably at least nine of them are needed to make the book. The tenth might be used as a cover.

3) Have students cut out their sequence of drawings (cut edges of squares very evenly and straight). Have them make sure they keep the stages in the proper order (perhaps number them on the back). Stack the squares and staple the flip-books twice on the edge. Demostrate how to use the flip-book. Then watch the magic of metamorphosis appear before their eyes!

Flip-book Page: (Make about 10 per student on cardstock.)





History

Frog, Toad & Salamander: Folklore Galore!

Frogs: For centuries, frogs have been treated with a mixture of curiosity, superstition and fear. Perhaps because children seem to have such a fascination with frogs and tadpoles, fairy tales and other juvenile literature abound with frog characters, from Toad in The Wind in the Willows to *The Muppets'* Kermit. A whole genre of legends has frogs miraculously turning into princes.

Among the Haida Indians on the Queen Charlotte Islands, it is told that two large frogs guard the celestial kingdom of the Thunder-bird. Their duty is to croak loudly if strangers approach. Frequently frogs were carved on totem poles, where their presence was thought to prevent the destruction of the poles by enemies.

In ancient Egypt, frogs were considered a symbol of female fertility, and many Egyptian women wore frog amulets of gold or silver to enlist the aid of the midwife goddess, Heqit. In Italy, Greece and Turkey, frog amulets are still worn to ward off the 'evil eye' and in Japan frogs are considered to be symbols of energy and perseverance, and are encouraged to enter people's homes to be fed.

In Germany, tree frogs were attributed with powers of weather forecasting. Several would be kept inside a tall, wide-necked bottle half filled with soft water into which a miniature ladder was placed. The frogs supposedly climbed to the top with the advent of good weather and descended to the bottom in bad. Travelers, believing them to be more sensitive than a barometer, always consulted the frog jar before setting out on an expedition.

Perhaps the most bizarre use to which the hapless frog was put was in the 'cure' of disease. In England, the dried body of a frog was worn in a silk bag around the afflicted person's neck to prevent epilepsy and other fits. To cure warts, a live frog was rubbed over them, and the frog was then impaled on a thorn to die. Whooping cough was treated by placing a small frog in a box tied around the patient's neck. As the frog decayed, the cough was supposed to disappear. Young frogs were swallowed live as a remedy for general weakness, cancer and consumption.

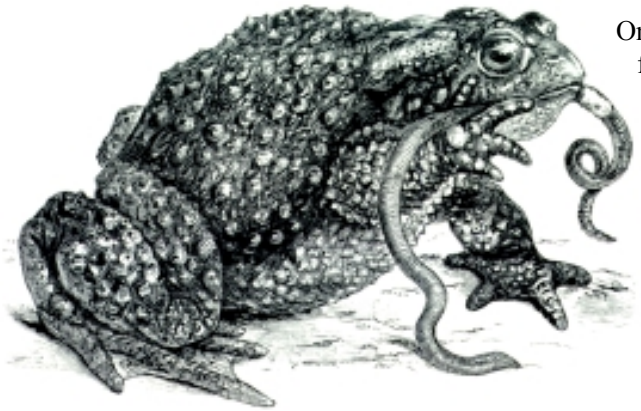
Salamanders: Salamanders were at one time considered highly poisonous. One superstition suggested that salamanders were so toxic they could wind themselves around the trunk of a fruit tree and poison all the fruit so that it would kill anyone who ate it.

The skins of salamanders were believed to be so cold that these small animals could crawl through fire without feeling the heat and even put out the flames. The skin was thought to be covered with hairs, and it was once believed that asbestos was made from this substance.

The Japanese dry salamanders and eat them in a concoction used to rid the body of worms. The Cherokee held the belief that if you ate the meat of the salamander and went into the fields soon after, all the crops would die. In heraldry, salamanders symbolize courage.

Toads: Toads played an important part in Chinese mythology. It was believed that a three-legged toad lived in the moon, each leg representing a different phase of the moon. When an eclipse occurred, it was believed that the toad swallowed the moon. In both China and Japan, toad skin is used as a source of leather.

The toad's head was thought to contain a stone that held medicinal and magical powers. Shakespeare alluded to this when he wrote, "The toad, ugly and venomous, wears yet a precious jewel in its head."



One superstition suggests that if a toad is driven into a corner, it will spit fire and fly out at you. Toads were considered friends of Satan and in Polynesia, were symbols of death. In Mexico, the toad represented the earth.

Frogs: From "Wildlife Review," Spring 1984, Wildlife Review Publishing Co., Victoria, BC, Canada.
Salamanders and Toads: From Wildlife Folklore by Laura C. Martin, The Globe Pequot Press, 1994.

Issue Investigation The Case of the Disappearing Frogs!

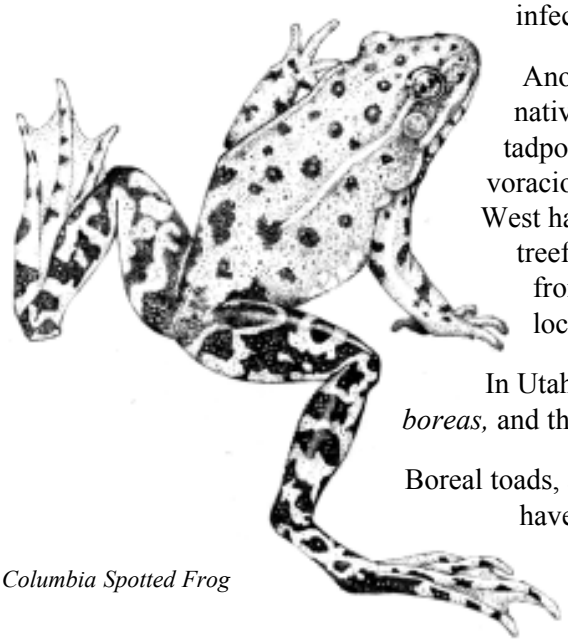
From Borneo to the Amazon to the mountains of Utah, amphibians worldwide have been disappearing at an alarming rate. Some species have become extinct. And scientists aren't exactly sure why!

In the past, local declines could usually be attributed to cases of direct habitat destruction such as filling of wetlands, draining of rivers and clearing of forests. Although such declines were distressing, scientists started to become especially troubled in the mid-1980s when numerous additional reports of amphibian declines were being documented from across the globe, many from pristine wilderness areas with little or no human disturbance.

For example, about 14 species of Australian rainforest frogs have died out or dwindled to near extinction over the past 15 years, the largest known breeding population of a salamander species native to the southeastern United States has virtually disappeared, and at least five of the seven native frogs and toads from a remote mountainous tract of Southern California are gone or in serious trouble. Worldwide evidence of a general decline has been piling up for years. By some estimates, nearly one-third of the amphibians in the United States may be imperiled. To scientists, all these declines seemed to indicate a potential global cause.

Addressing this puzzle of global amphibian decline has been the mission of the Declining Amphibian Populations Task Force (DAPTF), a group of professional biologists, established by the World Conservation Union in 1991. At this point, researchers are still far from finding any definitive answers, but more of the puzzle pieces are starting to fit. Mounting evidence seems to be pointing to not one, but a complex array of potential culprits including ultraviolet-B (UV-B) radiation, pesticides, toxic pollutants, acid rain, bacterial and fungal pathogens, over-collection and introduction of non-native predators. Although no one factor seems to be involved globally, findings are showing that all declines are in some way related to man's misuse of the environment.

Since high-elevation amphibian populations have been among the hardest hit, a suspicious eye was cast upon increased ultraviolet-B radiation pouring though the earth's thinning ozone layer. Experiments in the laboratory and in the field have shown that eggs of some frog species are especially susceptible to UV-B damage and fail to hatch or develop properly. The moist, porous skin of amphibians through which they breathe and drink, also makes them especially vulnerable to environmental pollutants such as pesticides and acid rain. An accumulation of environmental stresses is thought to be causing a breakdown in the immune systems of various amphibians, interfering with their natural ability to fight off diseases and infection.



Columbia Spotted Frog

Another more obvious threat to amphibians has been the stocking of non-native predators including trout and other sport fish, which gobble up eggs and tadpoles, into previously fishless lakes. Also, bullfrogs (*Rana catesbiana*), voracious predators that eat anything that fits into their mouths, introduced to the West have been shown to be a serious problem for native leopard frogs. Cuban treefrogs (*Osteopilus septentrionalis*), which hitched rides on banana boats from Cuba, did not wait long before they started devouring all the smaller local frogs.

In Utah, two amphibian species in serious trouble are the boreal toad, *Bufo boreas boreas,* and the Columbia spotted frog, *Rana luteiventris*.

Boreal toads, a subspecies of the western toad, grow to five inches in length, usually have a black-spotted throat, breast and belly, lack a cranial crest and have oval parotoid glands. They are a mountain toad and usually occur at elevations

between 6,000 to 11,000 feet. They breed in a variety of wetlands such as lakeside pools, mountain lakes and beaver ponds with scattered clumps of willows nearby.

Boreal toads, named for the Greek god of the north wind, were plentiful along montane lakes in the Wasatch and Uinta mountains as late as the 1970s. Today they are noticeably absent or greatly reduced in numbers in previously occupied areas and herpetologists know of only a few remaining populations, most in the northern part of the state. They are currently listed as a "Species of Special Concern" by the Utah Division of Wildlife Resources. In Colorado, New Mexico and Wyoming the species is listed as a "Candidate for Listing" by the federal government under the Endangered Species Act.

Research into their decline indicated that a certain infection caused by an unidentified pathogen may have contributed to a failure in the toad's immune system in some populations. Boreal toad eggs were also shown to have greatly diminished hatching success when exposed to elevated levels of UV radiation. Also, a fungus common in hatchery-reared fish may have been partly responsible for some declines. No conclusive answers explaining boreal toad declines currently exist, but a combination of factors, including habitat loss and degradation, environmental contaminants, disease and ozone layer depletion may all be involved.

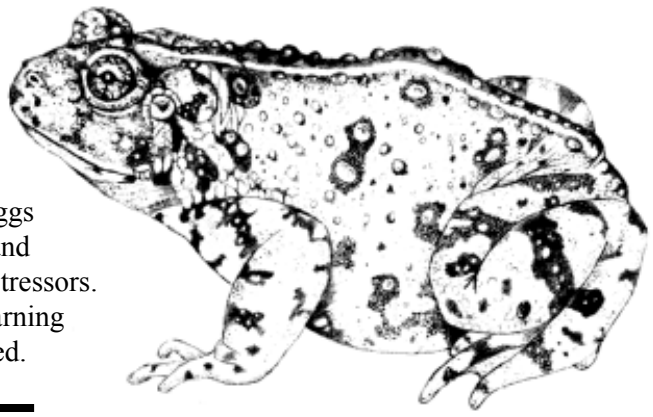
Columbia spotted frogs in Utah could be termed "unspotted frogs" as our populations do not have well-defined spots. They are dark olive-brown to almost gray-black in color with their belly and thighs frequently a striking salmon-red or yellow color. They have moderately rough skin, grow to about four inches in length and have eyes that are turned slightly upward. Their call is a series of short, rapid clicks that does not carry far. Columbia spotted frogs are very aquatic in habit and are associated with small, clear, spring-fed shallow wetlands with an abundance of aquatic vegetation.

Remaining Columbia spotted frog populations in Utah are found along the Wasatch Front in isolated pockets along the upper Provo River in Summit, Wasatch and Utah counties, in several ponds in Juab and Sanpete counties, and at few sites out in the West Desert. Habitat destruction and fragmentation have been the greatest threats to the species. Populations that formerly existed near Salt Lake City, Provo, Provo Canyon and Park City no longer exist, and Jordanelle Reservoir, near Heber, eliminated eight wetland sites occupied by spotted frogs when it was filled. Habitat lost cannot easily be replaced, and fragmentation is thought to impact genetic interchange between populations.

It is also speculated that the introduction of exotic mosquitofish (*Gambusia affinis*), through mosquito abatement programs, has negatively impacted spotted frog reproduction efforts in parts of Utah. This small fish is not only an effective and aggressive predator of mosquito larvae, but of Columbia spotted frog tadpoles as well. Biologists have observed mosquitofish waiting by spotted frog egg masses, consuming the tadpoles as they emerged from their gelatinous eggs.

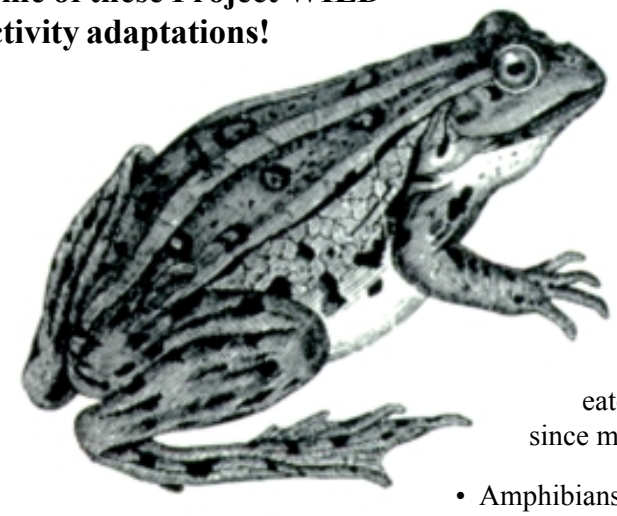
As of April 1998 Columbia spotted frogs in Utah have been protected via a "Conservation Agreement" with the U.S. Fish and Wildlife Service, an agreement authorized under the Endangered Species Act that gives the state responsibility for recovery of the species without the more restrictive protections afforded when a species is federally listed as threatened or endangered.

Why should we be concerned about amphibian declines? Other than being ecologically very significant and major contributors to the world's biodiversity, amphibians are well noted for their ability to act as indicators of environmental health. Their permeable skins, eggs lacking protective shells and complex life cycles within both aquatic and terrestrial realms make them especially susceptible to environmental stressors. They are like the proverbial "canary in the coal mine" sending us a warning knell as they die off. Perhaps this is a message we should begin to heed.



Boreal Toad

To teach about amphibians, try some of these Project WILD activity adaptations!



- Try **"Oh Frog!"** instead of "Oh Deer!" Discuss the habitat needs of frogs. Have students leap like frogs as they seek out habitat components. Substitute appropriate predators such as raccoons or herons.

- Have students learn and share information they learn about a variety of frogs, toads and salamanders by doing the activity "Interview a Spider" with a focus on amphibians as **"Interview an Amphibian."**

- Conduct the activity **"Quick Frozen Critters"** using frogs and flies as the predator and the prey species. In this activity one strategy that the prey uses to keep from being eaten is to remain motionless. This fits well with frogs and flies since most frogs rely on movement to recognize their prey.

- Amphibians exhibit a wealth of amazing adaptations that help them survive including myriad protective and warning colorations, poisonous secretions to avoid being eaten, many types of feet for various means of travel such as climbing, swimming and even gliding, and natural anti-freeze in their blood to keep from freezing. Have students explore amphibian adaptations and follow up with "**Fashion a Frog,"** an adaptation of "Fashion a Fish" from the Aquatic Project WILD activity guide.

- **"How Many Frogs Can Live in this Pond?"** is an adaptation of "How Many Bears Can Live in This Forest?" This activity adaptation has been already written up and can be requested by calling the Project WILD office at (801) 538-4719. The adaptation incorporates a fun "feeding as frogs do" twist where students are given party "blowouts" with Velcro on the tip that represent frog tongues. They must use these tongues to capture flies with Velcro on them.

- Have students undertake a **"Frog Song Survey"** following in the mode of the activity "Bird Song Survey." Frog calls can be heard on the Internet at a fair number of sites. Start with links provided at http://www1.teleport.com/~dstroy/wierd/general /songs.html. To purchase a recording called "Frog and Toad Calls of the Rocky Mountains and Southwest," contact the Library of Natural Sounds, Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, NY 14850. Phone number: (607) 254-2415. E-mail address: libnatsounds @cornell.edu. "Sounds of North American Frogs" is another recording available from Smithsonian Folkways at http://www.si.edu/folkways/45060.htm. Data collected may possibly be used by the North American Amphibian Monitoring Program at http://www.im.nbs.gov/amphibs.html.

- The activity **"Power of a Song"** can be done with an amphibian focus as well. Check out a set of good links to frog songs at http://frog.simplenet.com/froggy/songs.shtml. In addition, you can have students write **"Animal Poetry"** about amphibians. See http://www.im.nbs.gov/naamp3/naamp3poetry.html.

- **"Deadly Waters"** is an activity in the Aquatic Project WILD guide that examines how different types of pollution can affect aquatic wildlife. Explore the issue of amphibian deformities and the potential causes. This issue first became apparent in 1995 when some school kids studying a farm pond near Henderson, Minnesota found about 200 frogs with multiple, missing or twisted legs. Since that time, there have been numerous accounts of amphibian malformations reported from across the country, including one report in September 1997 of a boreal toad from Wasatch County, Utah with an extra fore limb. Scientists are trying to understand the causes of such deformities, but the answers are proving to be quite elusive and complex. Finding causes of frog deformities is important because scientists consider amphibians to be environmental barometers like the proverbial "canary in the mine," foretelling problems that may not only affect them, but humans as well. Find out more by visiting the North American Reporting Center for Amphibian malformations at http://www.npwrc.usgs.gov/narcam/index.htm.

Advanced Wildlife Workshop

Raptors of Utah

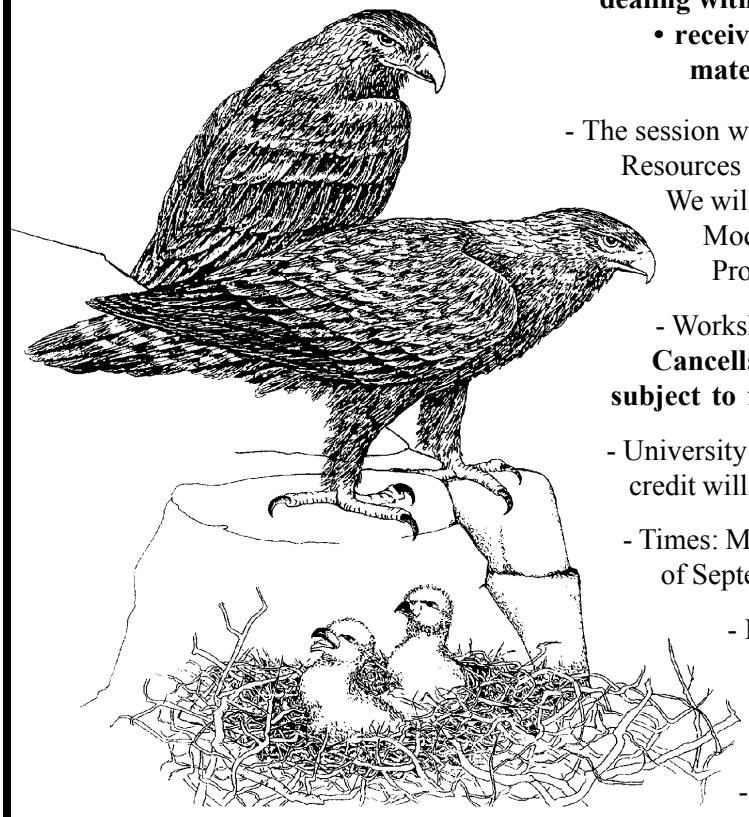
September 17-19, 1999

Registration Deadline
July 16, 1999

Join Project WILD and HawkWatch International for this exciting wildlife education workshop about raptors - hawks, falcons, owls and eagles. The workshop will be held within the magnificent Goshute Mountains which rise above the West Desert along the Utah-Nevada border.

During this workshop participants will have the opportunity to:

- **learn the basics of raptor biology and identification;**
- **observe hawks, falcons and eagles in the wild during their fall migration;**
- **take part in on-going migration and population monitoring research;**
- **explore some of the issues and problems surrounding raptors in Utah;**
- **experience a number of wildlife education activities dealing with raptors; and**
- **receive a variety of useful raptor education materials for use with children.**



- The session will begin at the Utah Department of Natural Resources and then we'll van-pool to the Goshutes. We will be camping in a rustic setting for two nights. Moderate hiking will be involved on Saturday. Project WILD will provide all meals.

- Workshop fee is $50. Limit: 20 people. **Cancellations received after August 20, 1999 will be subject to forfeiture of the workshop fee.**

- University graduate credit and state inservice/recertification credit will be available.

- Times: Morning of September 17 through the late afternoon of September 19, 1999.

- Mail registration and fee by **July 16** to Project WILD, Utah Division of Wildlife Resources, 1594 West North Temple, Suite 2110, PO Box 146301, Salt Lake City, Utah 84114-6301.

- Questions, Call Diana Vos at (801) 538-4719.

Return form with $50 check payable to UDWR

Name _____ Phone (h) _____ (w) _____

Address _____

_____

Occupation _____

Project WILD Workshop taken when? _____ and where? _____

project WILD

Utah Division of Wildlife Resources
1594 West North Temple, Suite 2110
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Growing WILD is written by Diana Vos. Edited by Vicki Unander. Illustrators: Katrina Nelson and Alan Rawley, plus additional clip-art selections.

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